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Before the
Federal Communications Commission
Washington, D.C.

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In the Matter of	)	
	)	
Telecommunications Services	)	CS Docket No. 95-184
Inside Wiring	)	
	)	
Customer Premises Equipment	)	

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Comments of Scientific-Atlanta, Inc.

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Scientific-Atlanta submits these reply comments in response to the Notice of Proposed Rulemaking in the proceeding, FCC 95-504, released January 26, 1996.

Summary of Position

The Commission should focus its regulations narrowly on the issues of home wiring in the context of rapid changes in technology and the passage of the Telecommunications Act of 1996. The Commission should recognize that cable and telephone networks are disparate in nature and that any regulatory scheme that may be suitable for one type of network, is probably not appropriate for the other type of network.

Description of Company

Scientific-Atlanta is a world leader in the development and deployment of broadband communications systems and satellite-based communications networks. The company is a leading supplier of products and systems for building and operating the most modern and efficient broadband networks. Over the past 20 years, the company has created more than 3,000 jobs and its exports have increased at a compound annual rate of almost 20 percent and are expected to comprise 50 percent of sales by the end of the decade. Accordingly, Scientific-Atlanta has a strong interest in regulations affecting cable television equipment, including the rules proposed in this proceeding.

Home Wiring

The focus of this proceeding is and should remain inside home wiring. Scientific-Atlanta reviewed the initial comments on home wiring and was surprised by the paucity of input on how new and emerging technologies, and in particular digital technology, will potentially affect home wiring. There are issues relative to the reverse path and the use of spectrum, as well as the adequacy of existing wiring, that cannot be readily clarified in terms of how they will play out in the digital and advanced technology world of tomorrow. Digital technology may be deployed within the home, at the side of the house or on a pole or at a location nearby. Demarcation determinations could affect the nature and deployment of these digital and advanced technologies. For this reason, the Commission should, to the extent practicable, defer to private, voluntary standards setting organizations. Scientific-Atlanta has been extensively involved in many of the initial deployments of broadband networks and believes that the deployment of these new technologies is in an extremely fluid state and that the Commission should seek to avoid making determinations and points of demarcation which may hamper the deployment of new technology. These decisions are best left to private, voluntary standards setting organizations.

Customer Premises Equipment

The Commission should not apply Part 68 and *Computer Inquiry* regulations to cable systems. Cable systems are very different from telephone networks. Cable systems have very little in common technically with telephone systems and much of the hardware that is in the cable subscriber's home would be considered transmission equipment in a telephone system. Attached as Appendix I is a lengthy description of the nature of and differences in telephone and cable systems.

Unbundling

The Telecommunications Act of 1996 gives cable operators wide latitude in terms of the treatment of costs involving the bundling of cable services and equipment. The rate regulation provisions are terminated for small systems, so these small operators have considerable discretion in determining how to treat cable equipment for purposes of itemization on a subscriber's bill. The 1996 Act terminates rate regulation of cable programming tiers effective March 31, 1999 and also permits the aggregation of equipment costs over franchises, systems, regions, and companies based on regulations which must be promulgated within 120 days of enactment. Thus, large operators also have enormous flexibility in determining how equipment costs are treated. The only specific requirements are that the equipment costs be separately stated and that the equipment costs not be subsidized by the costs of the service.

Standards

The 1996 Act also seeks to limit the role of government in the setting of standards, as well as the participation of entities that are not accredited standards organizations. For example, the so-called Eshoo amendment limits the ability of the Commission to set standards for consumer electronics equipment compatibility under that provision of the statute (47 U.S.C. 544a). The statute also sets forth restrictive requirements which must be followed by any entity that is not an accredited standards development organization (47 U.S.C. 273(d)(4)). In making any decisions or determinations that have the effect of setting standards or actually do set standards, the Commission should take into the account these provisions which were not enacted until after the drafting of the original Notice of Proposed Rulemaking.

Respectfully submitted,

Bill Lingley

Appendix I - Scientific-Atlanta Position Paper on Telephone and Cable Networks

Executive Summary

Cable, computer, telephone and other networks now have widely varying features and functions which are converging in cyberspace. These differences are based on how humans take in information and use it. For example, telephone networks are interconnected and interoperable to enable everyone to talk to each other over their telephones. By contrast, cable networks are broadband but not fully interactive to allow consumers to receive television signals which require much more bandwidth.

America's free market system for television and telecommunications has been dynamic and innovative, enabling the American consumer to enjoy the best and most advanced communications infrastructure in the world. For example, the cable set-top terminal has helped the American consumer to overcome obstacles to new technology, such as the long life cycle of the television set in the home. These converters or set-top terminals enabled delivery of additional television programming to older television receivers and provide other technology advances without requiring the purchase of a new television.

While the cable, telephone and computer networks are all merging in cyberspace, it would be regulatory overkill to impose the regulations that now govern each of these industries on the other industries that are in the process of convergence. The imposition of such regulations would slow down the very process of convergence and thwart the deployment of new technology.

Cyberspace Will Be Open, Interconnected, Interoperable and Have Portable Devices

Cyberspace (also called the information superhighway) involves the convergence of a variety of very different networks with widely varying functions and services. Many of these differences are based on how we humans take in information and use it.

For example, humans take in information at about 30 hertz through our sense of touch, 30 kilohertz through our ears and 30 megahertz through our eyes.

Much of our verbal or oral communication is done through the telephone network. Because we have a need to talk and listen to a wide variety of people, the telephone network is a switched, interactive network, enabling each individual to talk directly and privately with any other individual who has a telephone. The need to connect any individual or household to any other individual or household has dictated that most of the intelligence is in the telephone network and very little of the intelligence is in the terminal or telephone. The requirement to reach everyone with a telephone necessitates the interconnection and interoperability of telephone networks.

The telephone network has very limited bandwidth, because we take in information at up to 30 kilohertz through our ears. Historically, residential phone lines have transmitted 9,600 bits of information per second. Today's most advanced telephone networks, or ISDN, transmit up to 128,000 bits per second to and from a home or business. Fiber optic lines between cities and neighborhoods have much larger capacities. It is easier to develop a switched network for the relatively small amounts of information contained in a telephone call or data communication (such as a fax). Nevertheless, the complexity of a switched network has required that telephone systems make huge investments of $20-30 billion a year in these networks.

The cellular telephone network is a subset of the traditional telephone network. In a cellular or mobile network, there is a requirement not only to communicate with a fixed phone, but with a telephone which is moving around. Also, cellular networks are a relatively new development and for this reason have been able to incorporate some advanced features from their inception. Consequently, much more of the intelligence in the cellular network is in the telephone or terminal. The cellular model is important, because it is the most recent major network to be developed and it is likely to pattern the model for cyberspace or the information superhighway. The intelligence will probably be split more evenly between the network and the customers premises equipment or terminal.

While human visual capability extends to 30 megahertz, a single analog over the air broadcast channel is transmitted over 6 megahertz of spectrum or six million herz. Cable television networks originated as a means of retransmitting over the air broadcast channels, but today there is much additional programming provided to the consumer through satellite delivery, fiber transmission and local access channels. The cable network transmits or "broadcasts" all of these signals from a single point or headend to all of its subscribers using what is usually called a tree and branch architecture. The traditional cable network is not switched and has very limited interactive capabilities. It is not necessary to connect a subscriber with other subscribers. Consequently, most of the 10,000 cable systems are not connected with each other.

A 30 channel cable network utilizes 180 megahertz and a 150 channel networks utilizes 900 megahertz of bandwidth. Thus, cable television networks are broadband networks with as much as 100,000 times more bandwidth to the home than a traditional telephone network. New digital compression technologies allow cable systems to squeeze more than one and as many as 10-15 channels of programs into the same bandwidth as one 6 megahertz analog over the air broadcast channel, allowing cable networks to provide hundreds of channels of programming. Television sets and cable set-top terminals have tuners which enable the consumer to interface with and select specific channels transmitted over the cable network.

In cable networks, all of the television signals are processed through the headend, but with the transmission of so much bandwidth of material from the headend to the home, much more of the intelligence of the network is in the home or terminal. Thus, the cable converter or set-top terminal not only serves the same function as the telephone terminal or customer premises equipment, it also encompasses or extends back into some of the comparable functions in the telephone network located in the telephone company's central office.

Cable networks also have very different security needs. In telephone networks, voice communications are transmitted back and forth just between the calling parties by means of a dedicated switched signal path to each subscriber at the central office, by means of a dedicated port on the central office switch, making it somewhat difficult to breech security. In a cable network, all of the signals are transmitted to or shared by all of the subscribers or customers. Unlike in a traditional telephone network, each subscriber or home passed by a cable signal can pirate any channel or service they don't subscribe to. Thus, maintaining cable network security is much more challenging and important.

Computer networks have been radically transformed by rapid advances in software and chip technology. Both software and chip technology have origins in the telephone network or were originally produced for use in that network. Initially, most of the intelligence of computers was centralized in mainframes or mini-computers, but this changed radically in the 1980s and most of the intelligence is now in the terminal or personal computer. In their early years, computers were used to process data and the processing power was at a relatively low rate. Computing power, however, has doubled and will continue to double every eighteen months, representing a million fold improvement in the processing power or productivity over the past forty years. This is known as Moore's law, named after Gordon Moore of Intel. Personal computers now have the power to: process vast amounts of data, facilitating a plethora of new data applications; enabling the utilization of voice over computer; and even allowing some limited forms of video, such as video conferencing, video games and pictures. New advances in chip power will enable computers to handle real time video such as broadcast quality video and movies. Computers have traditionally used the telephone network for networking or interconnecting voice and data applications, but with the rapid increases in computing power the telephone network does not have enough bandwidth for some of the new, advanced applications, thereby creating a bottleneck.

Cyberspace will entail the convergence or upgrading of these networks. Cable television networks will eventually need to become switched and more interactive. Telephone and computer networks both will become more broadband. Broadband, interactive, digital networks will require large capital investments to upgrade or replace existing networks. The intelligence will likely be divided fairly evenly between the network and the terminal.

Cyberspace will have almost unlimited bandwidth and provide the consumer with almost limitless access to information, data and video. Thus, the computer and cable set-top terminal will play a critical role in the interface, because of the inherent limitations on human perception - 30 hertz for touch, 30 kilohertz for the ear and 30 megahertz for the eyes. As noted by Jay Keyworth, humans lack the broadband input channel to access all the bandwidth directly - the computer and converter will provide the interface.

All of these networks will need to be interoperable, open, portable and fully interconnected. Interoperability is the ability to easily substitute or mix a similar product from different manufacturers or vendors. Consumers are accustomed to interoperable products, because almost everything has this capability - light bulbs, tires, gasoline, televisions, and VCRs. Telephone networks are interoperable, because they are all interconnected and have to be standardized in order to communicate with each other. Historically, computer and cable television networks have not generally been interoperable, in part because they have not been interconnected and due to the importance of security to these networks.

Standards and interoperability for security functions encourage theft and piracy. If pirates have only one security system or standard to compromise, the economic incentives to compromise the standard are enormous. If pirates can't break or compromise the technology, they usually find a way to circumvent or compromise the human interface. With multiple standards for security, the economic incentives for piracy decrease and the ability of pirates to compromise the system are reduced. The satellite backyard dish market has a single standard for security. Pirates broke the system within months and there are estimates that well over half of the programming at one time was pirated. Programmers declined to provide their programming to the consumers in this market, because there was such a low percentage of paying customers. Rates for honest customers were much higher, in part because they were in effect subsidizing the pirates. The growth of the entire industry was stunted and the consumer ultimately lost the programming and paid the bill.

A number of different technical methods are used to scramble television signals in cable systems, including: synch depression or suppression which suppresses the horizontal or vertical synch pulses, video inversion, frequency inversion, video jitter, time reversal, line dicing and permutation of video lines. Most systems use combinations of these devices with different levels of security at varying prices.

Signal piracy is a pervasive problem. Cable television, with 60 million subscribers, estimates that it has over $4 billion in theft. Cellular telephone, with about one quarter as many subscribers (15 million), has an estimated $1 billion (or one-fourth as much) in signal piracy. The cellular network uses the air waves and mobile phones, so it is much more vulnerable to theft than the traditional telephone network. Some analysts attribute the slow growth of MMDS and the demise of some wireless cable networks to piracy of the airwaves. The pervasiveness of theft can't be dismissed; it poses an important threat to development of cyberspace and the information superhighway.

Computer networks have been interconnecting at an exponential rate, as is witnessed by the explosion in the Internet. The Internet is today's largest, most advanced network and it is open and interoperable. Cable networks are also moving to interconnect. Interconnection is driving both computer and cable networks to interoperability and more open systems. Security is the major remaining reason for not becoming interoperable. In the new digital environment, however, security functions are often being separated from the rest of the terminals, making an open architecture and interoperability much more easily achievable. The economic and technological requirement to be interconnected in cyberspace will necessitate interoperability for these networks.

Consumers also expect that goods and technology will be portable - the ability to move their owned equipment across town, state or country and still be able to use the equipment as before in the new location. Most telecommunications equipment is portable - telephones, televisions, AM/FM radios, DirecTV and cellular phones. Most of these networks are interconnected. For example broadcast television and radio programming that is not locally originated are transmitted over satellite and fiber links to local stations and then to consumers, resulting in a need for portability. Cable television set-top terminals and garage door transmitters are not portable and neither network is currently interconnected. The future interactive digital network will be fully interconnected and will almost undoubtedly require portability. Everyone will be connected to everything and an inability to be portable will result in a competitive disadvantage.

The development of cyberspace or the information superhighway will result in a transition between today's analog services to, eventually, a mostly digital or all digital network. In the digital world, all services - data, voice and video - are in the form of bits. During their transmission, it is difficult to differentiate one type of service from another since they are all transmitted in the same format - digital bits of 1's and 0's. However, the analog world, where the transmission is in the form of waves and the actual real life visual images - the format used for today's over the air broadcast services, will remain around for a long period of time. Only rarely does a new technology directly substitute and replace an old one, as was the case with compact discs which displaced records. Much more often, the new technology augments or supplements the old one, as radio news did with newspapers, television did with radio, and cable television did with broadcast television.

Hybrid fiber coax architecture (where fiber is used for transmission to a neighborhood node and from there by coaxial cable to the home) will be used extensively, because it can handle both analog and digital services, whereas fiber to the curb and fiber to the home systems are generally limited to digital services and can be built only with significant or major additional costs to the consumer. Hybrid fiber coax networks will support existing broadcast services, reduce costs and allow analog to digital migration of television.

The availability of the new, advanced digital services will be dependent on the development of a digital home communications terminal to decode or decrypt bits of information or services in the home and provide interactive capability. Silicon chips will drive the development of these home communications terminals. These terminals required 7 major chips in 1995, a figure which is expected to be reduced to 1-2 by 1998 through integration and integrated circuit manufacturing advances. A crucial issue is whether the cost of the home communications terminal can be reduced sufficiently to make it economical to place these units in the home - a figure which depends on how many of these new services the consumer is willing to pay for. Most of the trials and projections to date suggest that breakpoint is $300. However, realistic estimates by manufacturers of the cost of these terminals indicate it will be some time before this price point is reached. Further, by the time the breakpoint is reached, there may be new functions and features which will need to be built into the home communications terminal.

This is a process similar to what is happening in the computer industry - the price of the chip falls dramatically but the cost of the typical computer system does not. For example, Intel's 386 chip was originally widely offered at $2,000, but today's cost is below $50. When the cost of a chip falls, the consumer generally needs or demands a more powerful or advanced chip such as a 486 or Pentium, as well as better and more advanced software, monitors, printers and other peripherals. This process may also occur with home communications terminals. If it does, an economic solution to the price breakpoint would be to place some of the intelligence of this terminal in the network and to encourage and allow the consumer to buy the terminal in retail outlets. Thus, the consumer could pay $200-300 for a terminal at a retail outlet, while $200-300 of the intelligence could be built into the network and be paid for by the network provider such as the cable operator or telephone company.

Scientific-Atlanta has been extensively involved in the first two major digital networks - Time Warner's Orlando Full Service Network and U.S. West's Omaha Digital Interactive Network. We are also working on the Digital Interactive Video Services Networks for Bell South, Ameritech and Southern New England Telephone, as well as numerous advanced networks for major cable operators. Based on our experiences with these networks, many of the interoperability and portability problems currently being experienced in the analog world will be resolved in the marketplace for the new digital networks and services.

Set-Top Terminals Have Solved More Consumer Electronics Equipment Problems Than They Have Created

America's free market system for television and telecommunications has been dynamic and innovative, enabling the American consumer to enjoy the best and most advanced communications infrastructure in the world.

Cable television and the set-top terminal or converter are excellent examples of American innovation and how the United States developed the best home entertainment system in the world. In 1948, John Walson created the nation's first cable system by adding new antennas and boosters and wiring individual homes with cable. Walson built his system in order to provide three channels of television service to people in a deep valley in Mahoney City, Pennsylvania. By providing access to television programming, Walson was able to sell televisions from his appliance store. His efforts led to the widespread deployment of cable for delivery of services not accessible by other means. For example, Walson was also the first cable operator to deliver HBO in 1972.

One of the obstacles to new technology has been the television set which has a long life cycle of 10-15 years in the home, but serves a marketplace where innovation is rapid. In order to avoid obsoleting the consumer's investment in television sets while at the same time providing the consumer the latest in technological advances, the American cable television industry developed the set-top terminal. In the early and middle 1970s, transistorized amplifiers and aluminum sheath coaxial cable, as well as microwave links, were used to deliver television programming in excess of 12 channels. Television set-top terminals (STTs) were deployed to enable delivery of additional television programming to older technology television receivers. Cable consumers liked these set-top terminals, because they provided access to new services without requiring the purchase of a new television.

In the middle 1970s, communications satellites and set-top terminals were used to provide additional 'premium' programming (HBO, CNN, the Discovery Channel) augmenting the programming distributed over broadcast network television stations. In the late 1970s and early 1980s, new features were added to set-top terminals which provided further benefits to subscribers without requiring these consumers to buy new televisions. These terminals enabled cable operators to offer over 36 channels, remote control of channel selection and volume, rapid access to favorite channels and premium services such as movie channels. In the late 1980s, the consumer was able to receive 100+ channels, exert parental control and receive addressable services, all through the set top terminal. Overall, converters have solved far more consumer electronics products problems than they have created.

Over time, some of these new features gravitated into the television set. For example, television sets now tune more than 12 channels and many televisions can tune to the complete cable channel line up for all analog channels.

Today, the amount of bandwidth or information transmission capacity available through the cable system is unequaled by any other delivery medium available to the vast majority of households. The consumer is now beginning to receive on-screen programming guides, messaging, virtual channels, near video on demand and other services such as CD quality digital audio and Sega games.

Television sets have a 10-15 year life cycle in the home. Thus, in each of these cases, the installed base of television sets made it impractical for consumer electronics manufacturers to move rapidly enough to meet the needs of the dynamic American market and the consumer.

One key reason for the complexity in the issues involving cable television and consumer electronics equipment compatibility is that information transported by the broadcasting and cable signals is radio frequency modulated. Many of the other interfaces, such as those for telephone service and utilities such as electricity and gas, are at baseband. These baseband interfaces are simpler and much more direct. The broadcast and cable or set-top terminal interface, by contrast, extends back into the network and includes many of the functions that are in telephone and utility networks. For example, set-top terminal functions include tuning, demodulation, decryption and addressability. The broadcast industry has no box, terminal or converter which serves this function, so the cable industry must provide its own terminal. With radio frequency modulation, cable television has additional responsibility for cable signal leakage and its responsibility doesn't stop at the poll, the house or the converter, but extends all the way to the input of the television. Signal leakage issues can include airplanes flying overhead and other public safety issues. While traditional telephone networks are delivered at baseband and have not yet been affected by these issues, the telephone industry and computer industry face the same issues when dealing with broadcast video.